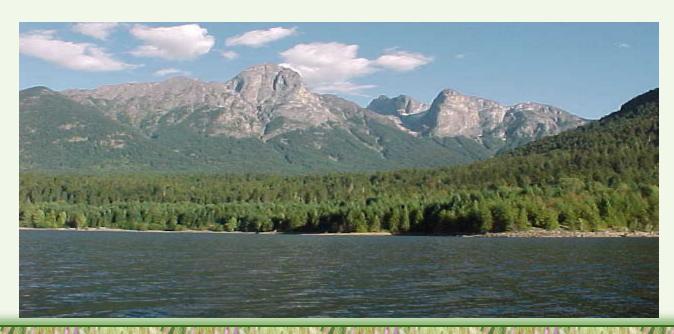
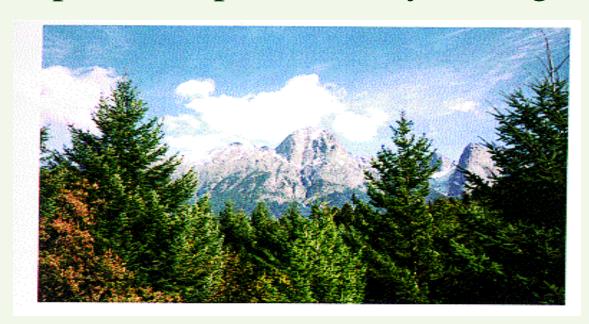
#### National Park Service

- Hozomeen Housing Sustainable Design Concepts
- North Cascades NPS Complex



### Sustainability

• *adj.:* of, or relating to a method of harvesting a resource so that the resource is not depleted or permanently damaged.



#### Site

Hozomeen Ranger
Station is a remote site
on the shore of Ross
Lake, Washington,
one mile south of the
Canadian border
within Ross Lake
National Recreation
Area.



### Previous Housing



### Previous Bunkhouse



### Previous Storage



# Previous Shop



### New Facility Considerations

- Health, safety and comfort of the users
- Impact on the environment
- Long and short term costs



# Technology

- Solar Applications
- Energy Conservation Techniques
- Manufactured Wood Products
- Sustainable Forest Practices
- Recycled / Recyclable Materials
- Waste Handling



- Structures sited for maximum solar gain
- Solar voltaic energy system
  - Primary Energy Source
  - Propane Powered Generator Back-up

# Solar Voltaic Power System

#### System Components

array 7,200 W Solarex

batteries 48kWwh Absolyte - IIP GNB

controller Ananda Power Technologies

• inverter SW 5548 Trace Engineering

generator 25kW Generac Propane

### Solar Panels



#### Inverters



### Controllers



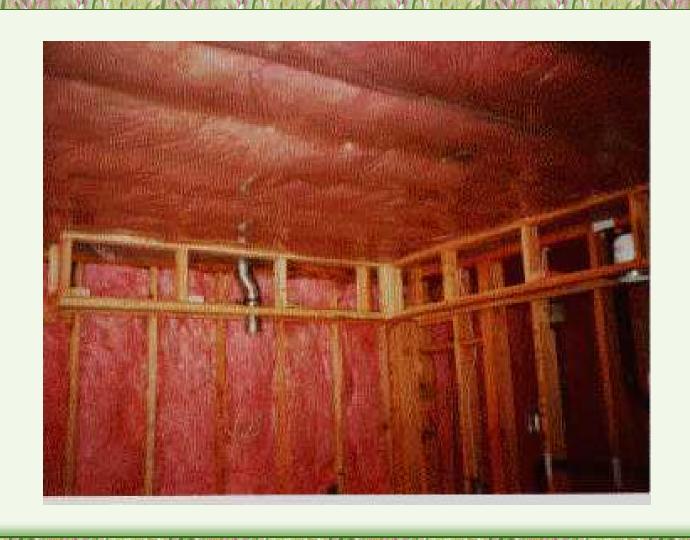
### **Batteries**



# Energy Conservation Techniques

- High rated insulation with vapor/moisture barriers
- Double pane insulated windows
- Hydronics space heating utilizing domestic hot water heater
- Low wattage appliances and lighting

### Insulation & Vapor Barrier



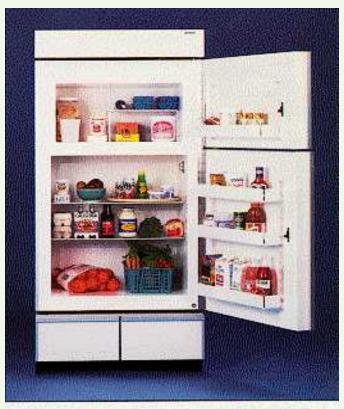
### Windows & Moisture Barrier



# Hydronics System



### Low Wattage Appliances



SUN FROST RF16 with 13" cabinet

### Manufactured Wood Products

- TJI Floor Joist System
  - OSB joists
- Laminated Veneer Lumber (LVL)
  - Headers
  - Perimeter Joists

# TJI Joist System



### LVL Header



#### Sustainable Forest Practices

- Structural Lumber
  - British Columbia Sustainable Forest Practices
     Code
- Cedar Shake
  - Scientific Certification Systems Inc.

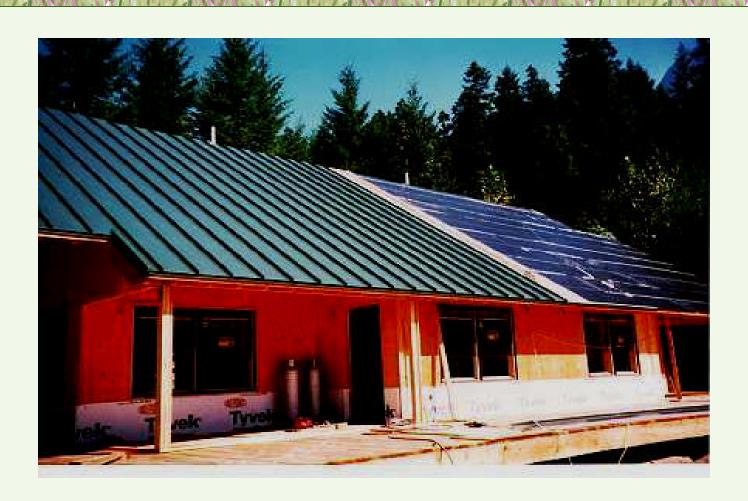
### Recycled / Recyclable Products

- Insulation
  - 25% recycled products
- Carpet
  - 85% recycled products
- Metal Roof
  - Recyclable Material
- Shop / Recycle Building
  - 25% recycled lumber from old compound

# Carpet / Hydronics Heater



# Metal Roof System



# Shop



# Waste Handling

- Upgraded Septic System
  - State certified design
- Recycle Shed
  - Recyclable collected, sorted and hauled
- Earthtub
  - compost organic household waste

# Septic Upgrade



# Recycle Shed



### **Earthtub**



#### Considerations Review

- Facilities Meet NPS Housing Standards
- Minimal Environmental Impact
  - Previously impacted building site
  - Recycled & recyclable building materials
  - Clean Energy Source
  - Comprehensive Waste Program
- Within Similar Construction Costs For Area
  - + 25% remote site factor

### Housing Units

- Two separate Duplex units
  - total of four individual quarters
  - each unit 1218 sq.ft.
- Individual quarters
  - two bedroom, one bath, kitchen, dining area,
     living room, screen porch, storage closets
- Shared facilities
  - laundry
  - trash / recycle / organic composting

